

What is claimed is:

1. A semiconductor light emitting device, comprising:

a transparent substrate, wherein the transparent substrate comprises a
5 semiconductor layer formed thereon, and the semiconductor layer comprises a scraggly
surface;

a light scattering-deflecting layer located on the scraggly surface of the
semiconductor layer; and

10 a semiconductor luminescent epitaxial structure located on the light
scattering-deflecting layer.

2. The semiconductor light emitting device according to claim 1, wherein a
refractive index of the light scattering-deflecting layer is different from a refractive
index of the semiconductor layer.

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3. The semiconductor light emitting device according to claim 1, wherein the
material of the light scattering-deflecting layer is a transparent material.

20 4. The semiconductor light emitting device according to claim 1, wherein the
material of the light scattering-deflecting layer is selected from the group consisting of
Si, Ge, and III-IV semiconductor, wherein the III-V semiconductor is selected from
the group consisting of GaAs, InP, AlGaInP, GaN, AlN, InN, and AlInGaN.

25 5. The semiconductor light emitting device according to claim 1, wherein the
material of the light scattering-deflecting layer is an insulating material, and the

insulating material is selected from the group consisting of SiO₂, Si₃N₄, TiN, Al₂O₃, MgO, GaF₂, ZnS, and SiC.

6. The semiconductor light emitting device according to claim 1, wherein the
5 material of the light scattering-deflecting layer is a metal material, and the metal
material is selected from the group consisting of Cu, Ag, Au, Zn, Cd, Mg, Al, Ga, and
In.

7. The semiconductor light emitting device according to claim 1, wherein the
10 light scattering-deflecting layer and the semiconductor layer are conformal.

8. The semiconductor light emitting device according to claim 1, wherein the
light scattering-deflecting layer fills up and levels the scraggly surface of the
semiconductor layer.

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9. The semiconductor light emitting device according to claim 1, wherein the
pattern of the scraggly surface of the semiconductor layer is selected from the group
consisting of bar convex, circle convex, octagon convex, hexagon convex, tetragon
convex, triangle convex, bar concave, circle concave, octagon concave, hexagon
20 concave, tetragon concave, and triangle concave.

10. The semiconductor light emitting device according to claim 1, wherein the
semiconductor luminescent epitaxial structure comprises a n-type semiconductor layer,
a luminescent structure, and a p-type semiconductor layer stacked in sequence.

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11. A semiconductor light emitting device, comprising:
- a transparent substrate, wherein the transparent substrate comprises a semiconductor layer formed thereon, and the semiconductor layer comprises a scraggly surface;
- 5 a light transparent layer located on the scraggly surface of the semiconductor layer, wherein a refractive index of the light transparent layer is different from a refractive index of the semiconductor layer; and
- a semiconductor luminescent epitaxial structure located on the light transparent layer.

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12. The semiconductor light emitting device according to claim 11, wherein the material of the light transparent layer is selected from the group consisting of Si, Ge, and III-V semiconductor, wherein the III-V semiconductor is selected from the group consisting of GaAs, InP, AlGaInP, GaN, AlN, InN, and AlInGaN.

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13. The semiconductor light emitting device according to claim 11, wherein the material of the light transparent layer is an insulating material, and the insulating material is selected from the group consisting of SiO₂, Si₃N₄, TiN, Al₂O₃, MgO, GaF₂, ZnS, and SiC.

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14. The semiconductor light emitting device according to claim 11, wherein the material of the light transparent layer is a metal material, and the metal material is selected from the group consisting of Cu, Ag, Au, Zn, Cd, Mg, Al, Ga, and In.

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15. The semiconductor light emitting device according to claim 11, wherein the

light transparent layer and the semiconductor layer are conformal.

16. The semiconductor light emitting device according to claim 11, wherein the
light transparent layer fills up and levels the scraggly surface of the semiconductor
5 layer.

17. The semiconductor light emitting device according to claim 11, wherein the
pattern of the scraggly surface of the semiconductor layer is selected from the group
consisting of bar convex, circle convex, octagon convex, hexagon convex, tetragon
10 convex, triangle convex, bar concave, circle concave, octagon concave, hexagon
concave, tetragon concave, and triangle concave.

18. The semiconductor light emitting device according to claim 11, wherein the
semiconductor luminescent epitaxial structure comprises a n-type semiconductor layer,
15 a luminescent structure, and a p-type semiconductor stacked in sequence.

19. A method for manufacturing a semiconductor light emitting device,
comprising:

20 providing a transparent substrate, wherein the transparent substrate comprises a
semiconductor layer formed thereon, and the semiconductor layer comprises a scraggly
surface;

forming a light scattering-deflecting layer located on the scraggly surface of the
semiconductor layer; and

25 forming a semiconductor luminescent epitaxial structure located on the light
scattering-deflecting layer.

20. The method for manufacturing the semiconductor light emitting device according to claim 19, wherein a refractive index of the light scattering-deflecting layer is different from a refractive index of the semiconductor layer.

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21. The method for manufacturing the semiconductor light emitting device according to claim 19, wherein the material of the light scattering-deflecting layer is a transparent material.

10 22. The method for manufacturing the semiconductor light emitting device according to claim 19, wherein the material of the light scattering-deflecting layer is selected from the group consisting of Si, Ge, and III-V semiconductor, wherein the III-V semiconductor is selected from the group consisting of GaAs, InP, AlGaInP, GaN, AlN, InN, and AlInGaN.

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23. The method for manufacturing the semiconductor light emitting device according to claim 19, wherein the material of the light scattering-deflecting layer is an insulating material, and the insulating material is selected from the group consisting of SiO₂, Si₃N₄, TiN, Al₂O₃, MgO, GaF₂, ZnS, and SiC.

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24. The method for manufacturing the semiconductor light emitting device according to claim 19, wherein the material of the light scattering-deflecting layer is a metal material, and the metal material is selected from the group consisting of Cu, Ag, Au, Zn, Cd, Mg, Al, Ga, and In.

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25. The method for manufacturing the semiconductor light emitting device according to claim 19, wherein the light scattering-deflecting layer and the semiconductor layer are conformal.

5 26. The method for manufacturing the semiconductor light emitting device according to claim 19, wherein the light scattering-deflecting layer fills up and levels the scraggly surface of the semiconductor layer.

10 27. The method for manufacturing the semiconductor light emitting device according to claim 19, wherein the step of forming the light scattering-deflecting layer is performed by using a method selected from the group consisting of an evaporation method, a plating method, a metal organic chemical vapor deposition method, a molecular beam epitaxy method, and a hydride vapor phase epitaxy method.

15 28. The method for manufacturing the semiconductor light emitting device according to claim 19, wherein the pattern of the scraggly surface of the semiconductor layer is selected from the group consisting of bar convex, circle convex, octagon convex, hexagon convex, tetragon convex, triangle convex, bar concave, circle concave, octagon concave, hexagon concave, tetragon concave, and triangle concave.

20 29. The method for manufacturing the semiconductor light emitting device according to claim 19, wherein the semiconductor luminescent epitaxial structure comprises a n-type semiconductor layer, a luminescent structure, and a p-type semiconductor layer stacked in sequence.

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30. The method for manufacturing the semiconductor light emitting device according to claim 29, after the step of forming the semiconductor luminescent epitaxial structure is performed, further comprising:

- removing a portion of the p-type semiconductor layer and a portion of the
- 5 luminescent structure to expose a portion of the n-type semiconductor layer;
- forming a p-type electrode on the p-type semiconductor layer; and
- forming a n-type electrode on the exposed portion of the n-type semiconductor layer.

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